

Electricity From Syngas

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Issues

- Not reliable
- Lack of access to current benchmark, and component data
- DOE need to make data available, NASA NPSS is an example.
- Standardization in Europe
- Simulators need to think issues for manufacturers
- Model complexity

What Fuel Cell Developers Want ?

- Load follow models
- Flow/temperature/concentration distribution
- Reaction model of impact of Contaminant
- Application and control
- Reformer model
- Integrated and feedback control
- Reaction models polarization
- Start and shutdown model
- Simple models for robust control
- Model based diagnostics

What Turbine Developers Want ?

- Understanding of combustion- instability
- Blade cooling (steam, transpiration)
- Hot gas path material life and efficiency degradation
- Emissions
- Model based diagnostics
- damage mitigation - sensors

What Plant Designers Want ?

- Plant wide dynamic model
- Balance of plant performance-based models vs construction based models

Benefits to Owners

- Cheaper to model than build
- Pursue more alternatives
- Get more data from modeling
- Modeling identifies important parameters
- Identifies control stability issues

How will models be used

- Evaluate and explore alternatives
- Optimize and minimize experiments
- Identify Technology limits, roadmaps, gap analysis
- verify economic viability
- Accuracy depends models, blade cooling < 50 F, hot spots

High Priority Items

- Turbines
 - combustion stability
 - blade cooling
 - fuel injection
- Fuel cells
 - Flow/temp/species conc distribution
 - Reaction models
 - dynamics
 - applications

Barriers to Modeling

- Understanding of detailed combustion
- Better way to treat turbulence
- Excessive CPU time

Existing software and alternatives

- CFD- Finite volume based
- Moving boundary grid generation
- DOE develop codes available to public, i.e. NASA NPSS LANL CFD LIB (hindered by lack of user support)

Everybody's priorities are different, but our rankings

- Accuracy
- turnaround time
- visualization
- flexibility and modularity
- open architecture
- communication, special workshop, e.g. university consortium w industry steering group (pre-competitive models)

Information Exchange

- communication, special workshop, e.g. university consortium w industry steering group (pre-competitive models) i.e. SCIES
- DOE cost shared programs
- Government facilitates
 - PNGV
 - SECA

Government Roles

- Expand NASA NPSS to ground based application
- DOE, and national labs develop fundamental algorithms (in-house, BES, SBIR)
- Faster releasing data from government sponsored projects (FC)
- Facilitate data exchange

Short Term Targets

- Develop architecture for Vision 21 modeling suite
 - ID components
 - ID component interfaces
 - Develop Roadmap
- Plan competitive solicitation to develop Vision 21 plant model (1 or limited awards)
 - H'ware developers share proprietary info masked